Paper No. 31

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MARK A. MUELLER

Appeal No. 1998-0039
Application No. 08/372,701

HEARD: Jan. 9, 2001

Before PAK, WALTZ, JEFFREY T. SMITH, Administrative Patent Judges.

WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 29 through 43, which are the only claims remaining in this application (Brief, page 2).

According to appellant, the invention is directed to a method of preventing arcing during sputter deposition of a

metal film onto a substrate by use of a two-step pressure regime, initially using a high pressure until a conductive bridge is

formed between the clamping ring and the substrate, followed by a conventional, low sputter deposition pressure (Brief, pages 3-4). A copy of illustrative independent claim 29 is attached as an Appendix to this decision.

In addition to the admitted prior art from pages 1-4 of the specification, the examiner relies upon the following evidence of obviousness:

Nozaki et al. (JP '672) 60-145672 Aug. 1, 1985
(Published Japanese Application)

Jitsukawa et al. (JP '961) 61-183961 Aug. 16, 1986
(Published Japanese Application)[1]

Ku et al. (Ku), "Use of ion implantation to eliminate stress-induced distortion in x-ray masks," *J. Vac. Sci. Technol. B,* 2174-2177, Vol. 6, No. 6, Nov./Dec. 1988.

---

[1]All citations from JP '672 and JP '961 refer to full English translations of these documents, now of record. During the prosecution of this application, the examiner and appellant apparently have relied upon English abstracts of these documents (see the Answer, page 3). However, we do not attach copies of these translations to this decision since appellant's attorney, at oral hearing, indicated that appellant is now in possession of English translations of the JP '672 and JP '961 documents.

The claims on appeal stand rejected under 35 U.S.C. § 103 as unpatentable over the admitted prior art in view of *either* JP '672, JP '961 *or* Ku (emphasis added, Answer, page 3).[2] We *reverse* this ground of rejection for reasons which follow.

OPINION

The examiner finds that the admitted prior art on pages 1-4 of the specification shows "[a]ppellant's process of positioning a shield adjacent to the periphery of a substrate and depositing a metal such as W or TiW to avoid arcing" by forming a conductive bridge between the clamping ring and the wafer (Answer, page 4). The examiner then finds that the secondary references (JP '672, JP '961, or Ku) provide evidence of the obviousness of modifying the admitted prior art method by depositing metal at two different pressures to form compressive and tensile films that cancel the stresses to result in a much desired zero stress film (Answer, pages 4-5). The examiner states that it would appear that either low or

[2]We add the emphasis to the examiner's statement of the rejection to show that the examiner has applied the secondary references to JP '672, JP '961, and Ku *alternatively*. We also note that the examiner has mistakenly referred to JP '961 as "JP '963" on page 3 of the Answer.

high pressure could be used in a first stage as long as the second stage pressure complemented the stress formed in the first stage to result in a zero stress film (Answer, pages 5-6).

Appellant argues that the admitted prior art discloses an arcing problem but the proposed prior art solutions to that problem focus on modifications to the equipment of the sputtering chamber rather than on process changes (Brief, page 6). Appellant further argues that none of the secondary references mentions the problem of arcing or discloses any shield for the substrate (Brief, pages 6-9). Appellant specifically argues that JP '672 and JP '961 both teach the opposite process as recited in the claims on appeal, namely the application of low pressure followed by high pressure instead of the claimed regime of high pressure followed by low pressure (Brief, pages 6-7).

In any review of the examiner's obviousness analysis, we must first construe the claims to define the scope and meaning of any contested limitations. *See Gechter v. Davidson,* 116 F.3d 1454, 1460 n.3, 43 USPQ2d 1030, 1035 n.3 (Fed. Cir. 1997). We must apply to the language of the claims "the

broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification." *In re Morris,* 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997).

The examiner has found that the "admitted prior art" in the specification discloses that it was well known to position a shield adjacent to the periphery of a substrate to avoid arcing by forming a conductive bridge of metal between the clamping ring and the wafer (Answer, page 4, citing the specification, page 3, lines 17-24). However, this "well known" feature was accomplished with modified processing equipment, i.e., cutting down the hood area of the clamping ring so a bridge would more easily form (specification, page 3, ll. 17-22).[3] We do not agree with the examiner that any steps of the claimed subject matter read on this admitted

[3]It is also noted that appellant teaches that such modification of the hood area may result in excessive bridge formation which can result in contamination of the wafer (specification, page 3, ll. 22-24).

prior art. As we construe step a) of claim 29 on appeal as it would be understood by one of ordinary skill in the art, in light of appellant's specification, the shield or hood area reaches to the edge of the wafer or substrate and is not "cut down" to allow for more and easier metal bridge formation. See the specification, page 2, l. 23-page 3, l. 4; page 4, ll. 6-15; page 7, ll. 5-16 and Figure 2. Accordingly, the "admitted prior art" as applied by the examiner does not disclose or teach the limitations of claim 29 on appeal.

Additionally, as correctly argued by appellant (Brief, pages 6-7), we note that both JP '961 and JP '672 teach the use of low pressure in a first step followed by a high pressure treatment, which is the reverse order of the claimed process steps. Contrary to the examiner's position that the order of pressure treatment is immaterial as long as the compressive and tensile stresses in the films complement each other to form a zero stress film, JP '672 teaches that the introductory pressure should be a low pressure of about 4 millitorr "for the purpose of preventing the mixing of Ar gas and residual gas into the TiW film." See the translation, paragraph bridging pages 4-5. Furthermore, JP '961 teaches

that the high pressure step is accomplished at 10 millitorr (translation, page 7), which is below the claimed high pressure of 11 millitorr which is "sufficient to avoid arcing between said substrate and said shield" (see claim 29, step b), and claim 32). Finally, Ku does suggest the use of varying pressures during metal deposition to adjust the "membrane deflection" but does not teach or suggest the use of high pressure in a first step followed by a conventional low pressure step (see Ku, paragraph bridging pages 2176-2177).

For the foregoing reasons, we determine that the examiner has not established a sufficient factual basis on this record to support a *prima facie* case of obviousness. "Where the legal conclusion [of obviousness] is not supported by facts it cannot stand." *In re Warner,* 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967). Accordingly, the examiner's rejection of claims 29-43 under section 103 over the admitted prior art in view of

JP '672, JP '961 or Ku is reversed.

The decision of the examiner is reversed.

REVERSED

Chung K. Pak Administrative Patent Judge	)	
Thomas A. Waltz Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
Jeffrey T. Smith Administrative Patent Judge	)	

TAW:tdl

Patent Counsel
Applied Materials, Inc.
P.O. Box 450A
Santa Clara, CA 95052

APPENDIX

29. A method of depositing a metal layer on the surface of a semiconductor substrate having a periphery in a physical vapor deposition chamber comprising

a) positioning a shield adjacent to the periphery of a substrate,

b) depositing a metal from a target therefor onto said substrate at a first relatively high pressure sufficient to avoid arcing between said substrate and said shield,

c) reducing the chamber pressure to a second, lower pressure so that good quality metal layers are deposited, and

d) continuing to deposit said metal layer at said second pressure until a desired thickness is obtained.